

Cygnus Portable Solar Generator

User Manual v3.0

2011

For use with the following models:

CYG2400/460/24, CYG2400/920/24, CYG2400/1380/24, CYG3500/920/24, CYG3500/1380/24,
CYG5000/920/24, CYG5000/1380/24



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1. Introduction

1.1 Foreword

Firefly Solar Generators Limited takes this opportunity to congratulate you on the purchase of your new Cygnus Portable Solar Generator.

Designed and manufactured within the United Kingdom using only the finest European sourced electrical components, your new Cygnus Portable Solar Generator offers sustainable power generation with the reliability that you demand.

The purpose of this manual is to introduce you to the Cygnus Portable Solar Generator and provide you with a guide to the processes of setting up and operating your new product. This manual describes how your Cygnus Portable Solar Generator works, will help you with fault finding and examines what each component is doing and why.

1.2 Conventions

Throughout this user manual the following symbols are used:



WARNING

This symbol warns of the presence of a dangerous voltage which could cause harm to the operator.



This symbol indicates the potential of damage to the unit or connected devices.



This symbol indicates important or useful information.

1.2.1 Terminology

The following terms are used in this manual to provide greater clarity:

Firefly Solar Generators Ltd. will be referred to as “**The manufacturer**”.

The Cygnus Portable Solar Generator will be referred to as ‘**Cygnus**’ or ‘**Unit**’.

Any items that consume power will be referred to as ‘**Consumers**’.

State of Charge of the battery bank will be referred to as ‘**SOC**’.

1.2.2 Warnings



This user manual is an important part of the Cygnus Portable Solar Generator. It must be kept available to all operators and kept close to the unit so that it can be referred to at any time.



WARNING

When the unit is operating it generates potentially lethal voltages. Work must only be performed on the unit by the manufacturer or a qualified service engineer approved by the manufacturer.

Under no circumstances should operators open the unit’s enclosure.

All items connected to the unit including distribution cables and boxes should be regularly checked and adhere to the same local regulations and standards as a regular grid-tied mains installation.

1.3 Standards & Regulations

The Cygnus Portable Solar Generator conforms to the following standards and regulations:

Manufactured in compliance with ISO 9001:2008

LVD 73/23/EEC

EN 61000-6-1, EN 61000-6-3, EN 55014

IP23

WEEE Directive



CE IP23

1.4 Disposal & Recycling

The Cygnus Portable Solar Generator comprises of components that must be disposed of responsibly. For the sake of the environment many of the components within the unit can be recycled or reused. Firefly Solar Generators Ltd. will ensure the safe decommissioning and recycling of the unit at no charge if the unit is returned to the manufacturer. Otherwise, please contact the manufacturer for more information on safe and proper decommissioning of your Cygnus Portable Solar Generator.

1.5 Firefly Solar Contact Details

Firefly Solar Generators Ltd
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United Kingdom

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Fax: +44 (0) 1273 316 646

E-mail: info@fireflysolar.net

Web: www.fireflysolar.net

1.6 About Firefly Solar

Firefly Solar is the European market leader in the design and manufacture of off-grid, portable and permanent solar-powered generators. Our green energy products and services meet the needs of environmentally concerned individuals and organisations who are looking to reduce the carbon emissions caused by the use of fossil fuels and diesel powered equipment.

Firefly Solar generators harness energy supplied by the sun using photovoltaic (PV) cells, storing it for when it's needed. Additionally, multi-charge inputs allow kinetic and wind energy to be stored for convenient use. We are specialists in green energy storage systems – our expertise in batteries, electronics and software has enabled our generators to overcome many of the problems of intermittency which can be associated with renewable energy sources.

Firefly Solar generators can provide an uninterrupted electrical supply even in the absence of light or other charging input. Our award-winning products, which include the Orion, Cygnus, Pictor & Pyxis models, have been widely used by well-known brands such as Coca-Cola Enterprises, the BBC, Sky, Greenpeace, Friends of the Earth and Solar Aid.

Firefly Solar provide temporary stand-alone power for the events, broadcast, and construction industries; permanent stand-alone power for rural locations and telecommunications; and back-up (UPS) power with extended run times for locations with intermittent grid connectivity. Firefly Solar power generating equipment is zero emission, true silent running and eliminates the need for inflammable fuel.

2. Getting Started

2.1 Storage

1. Cygnus is designed to be used and stored outside. However, to prevent unnecessary weathering it is recommended that the unit is stored inside when possible.
2. It is recommended that the battery bank is charged regularly while in storage. Refer to Chapter 4, Section 5 for further information.
3. Cygnus should be switched off when in storage and not being charged to prevent unnecessary discharge of the battery bank.

2.2 Transportation, Loading/Unloading & Positioning

2.2.1 Transportation

1. Cygnus can be transported using a suitable trailer, light or heavy goods vehicle with adequate available payload. Check the relevant transportation documentation for suitability.
2. The gross weight of the unit can be found on the rating plate positioned on the left hand side of the unit. Please note that different models have different weights.
3. It is recommended that the unit is secured using suitable straps when in transit to prevent it from moving.



Always check the rating plate to ascertain the gross weight of the specific unit in question.



The unit must remain upright at all times.

2.2.2 Loading/Unloading

1. Cygnus must be loaded or unloaded using the correct equipment operated by suitably trained personnel.
2. Using the lifting ring; Cygnus can be lifted onto or off from transportation. The lifting ring is suitable for lifting all models of Cygnus regardless of the unit's gross weight.
3. Using the fork pockets; Cygnus can be loaded or unloaded with a suitable fork-lift truck.



Refer to the fork-lift truck operation manual for lifting capacity and manufacturer's operating instructions.

2.2.3 Positioning

1. The unit must be positioned upright on a flat, solid surface. Ensure that the unit is not at risk from being submerged in water above the fork pockets.
2. The unit should be positioned as close as possible to the chosen charging system (e.g. solar array, Kinectrics equipment, wind turbine) and close to its earth point.

2.3 Understanding the Cygnus Control Panel

2.3.1 Diagram of the Cygnus Control Panel

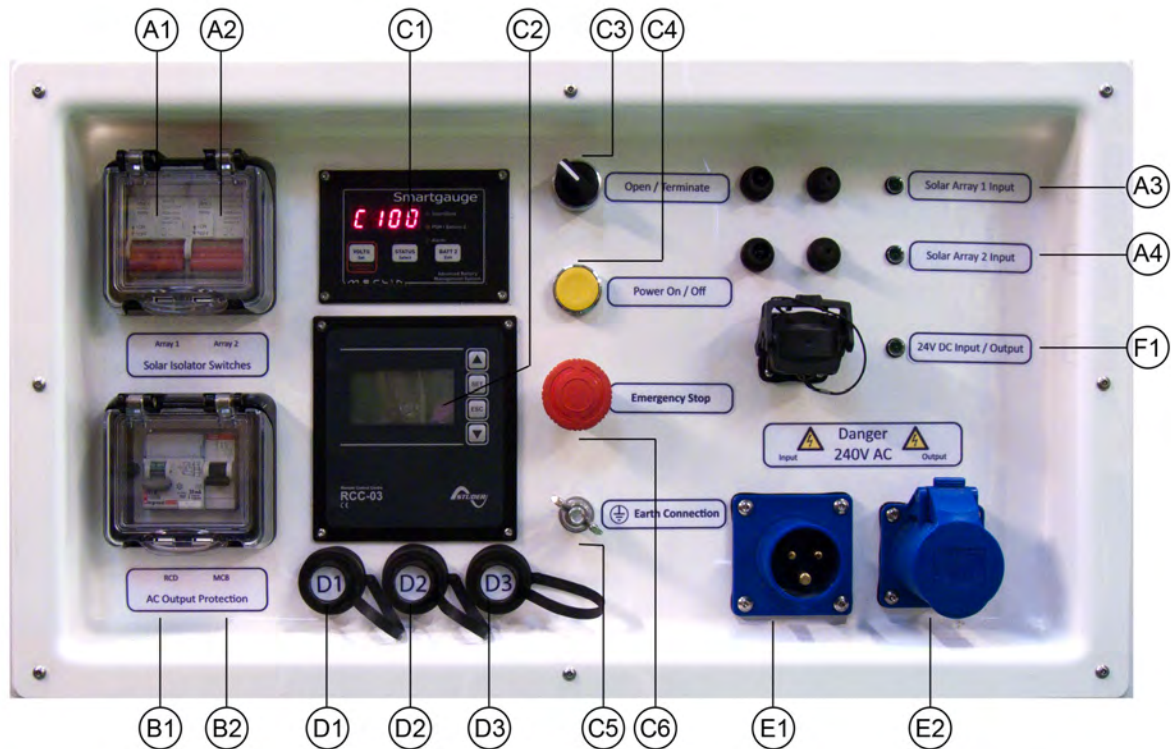


Fig. 1 - Cygnus Control Panel Component Reference

2.3.2 Explanation of the Cygnus Control Panel

A1	Solar Array 1 Isolator Switch – Switch off to isolate the Solar Array 1 circuit, on to enable it
A2	Solar Array 2 Isolator Switch – Switch off to isolate the Solar Array 2 circuit, on to enable it
A3	Solar Array 1 Inputs – 24V MC3 inputs for Solar Array 1
A4	Solar Array 2 Inputs – 24V MC3 inputs for Solar Array 2
B1	240V AC Out RCD – Earth leakage protection for main AC output (Residual Current Device)
B2	240V AC Out MCB – Overload protection for main AC output (Miniature Circuit Breaker)
C1	Smartgauge Battery Monitor – Provides a real-time display of battery bank voltage or SOC
C2	RCC-03 – Displays real-time information on inputs and outputs, also allows their adjustment
C3	Open / Terminate Switch – Used when multiple Cygnus Portable Solar Generators are linked together
C4	Power On / Off Switch – Enable or disable AC output
C5	Earth Connection – For earth rod (ground) connection
C6	Emergency Stop Button – Disconnects all circuits in an emergency
D1	Data 1 Connector – For connecting data cable in from another Cygnus when multiple units are used
D2	Data 2 Connector – For connecting data cable out to another Cygnus when multiple units are used
D3	Data 3 Connector – For use with optional charge controller remote control and display
E1	240V AC Input – For charging the unit from the national grid or secondary power system
E2	240V AC Output – Main output for powering consumers
F1	24V DC SPEC Pak Input / Output – For charging from wind or Kinectrics devices. Also gives 2 x 24V DC 40 A output

2.4 Connecting the Cygnus Portable Solar Generator

2.4.1 Earth attachment: Installing the Optional Earth Rod:

1. Find a suitable place to drive the earth rod into the ground. The earth rod should be driven down at least 600mm into the ground using a mallet and placed as near to the unit as possible.
2. Check the earth cable is securely clamped to the rod. The clamp may need retightening after driving the earth rod down.
3. On the control panel, locate the earth bolt (Fig. 1, C5) undo the earth bolt wing nut and remove one of the washers. Then slide the ring terminal at the end of the earth cable onto the earth bolt. Replace the washer and tighten the wing nut.



WARNING

A protective earth must be connected to the unit in compliance with applicable local standards and regulations. This can be done either by connecting to a suitable existing electrical earth, or by using an optional earth rod supplied by the manufacturer.

2.4.2 Connect the Inputs:

There are a number of means available to charge the unit. Instructions on how to connect charging inputs (e.g. solar PV, wind turbines, Kinectrics equipment) are available as appendices to this manual or included with those products at the point of purchase. All user manuals can also be downloaded from the manufacturer's website at www.fireflysolar.net

It is also possible to operate the unit only using the internal battery bank, without external inputs connected.



WARNING

Care must be taken to ensure that the correct connections are made to avoid the risk of electrocution or possible damage to the unit's internal components.



WARNING

Ensure that the cumulative power of connected consumers does not exceed the maximum power output of your unit— refer to the rating plate to ascertain the unit's maximum power output.



WARNING

All connected consumers must be fit for purpose— refer to their rating plates and manuals to ascertain the required input.



When Cygnus is connected to an external AC supply, the output voltage is transferred from its input. In this case the unit will not modify the AC output: Consumers will be supplied with an output identical to the source.

2.4.3 Connect the Output Power Cables:

Cygnus is supplied with a 16A industrial CEEform socket for the connection of AC power out to consumers requiring (Fig. 1, E2).

1. Before any power connections are made, ensure that both the RCD (Fig. 1, B1) and MCB (Fig. 1, B2) are switched Off.
2. Plug in the electrical consumers to the AC Out (Fig. 1, E2) socket on the control panel using a 16A CEEform industrial plug.

3. General Operation

3.1 Turning the Power On

Once all the above connections are complete, the unit is ready to be switched on.

1. Ensure that the Emergency Stop button is not depressed by rotating clockwise (Fig. 1, C6)
2. Switch on the RCD and MCB switches (Fig. 1, B1 & B2).
3. Switch on the unit using the Power On/Off Switch (Fig. 1, C4).
4. As the unit is switched on, a loud beep will be heard and the RCC-03 (Fig. 1, C2) backlight will illuminate.
5. The unit is now in standby mode.
6. "Message 012 use of battery temperature sensor" will be displayed for five seconds.
7. After which, the following should be displayed:

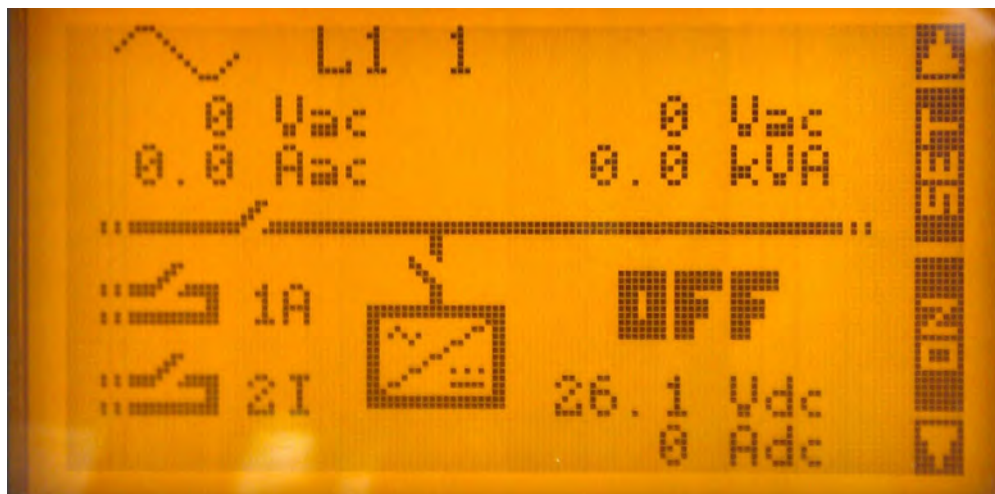


Fig. 2 - RCC-03, Unit in Standby

8. Press ESC on the RCC-03. The message 'Turn the System On?' will be displayed.
9. Press SET to accept and the unit will go out of standby mode and turn on. A number of changes will appear on the RCC-03.
10. The following will be displayed on the RCC-03:

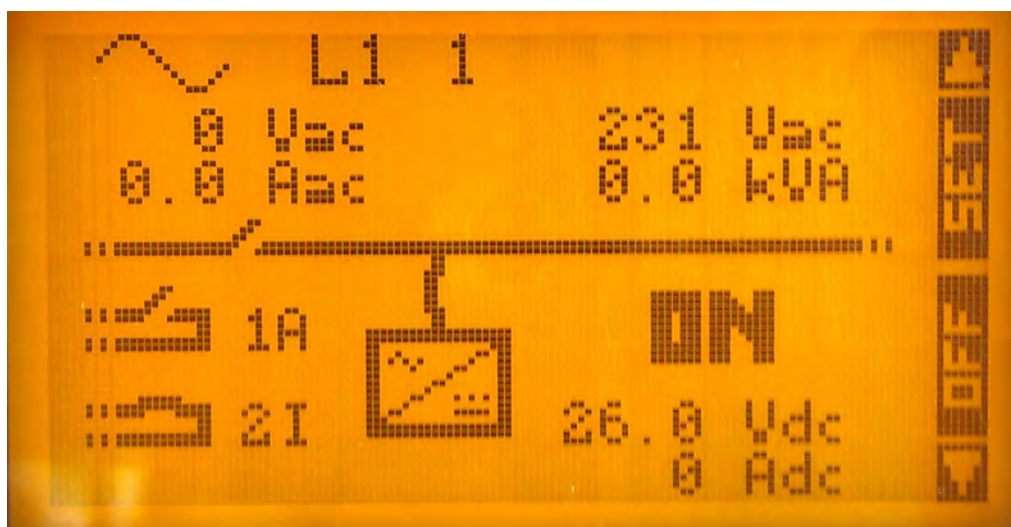


Fig. 3 - RCC-03, Unit On

11. The unit is now on and ready to supply power to connected consumers.

3.2 Monitoring the Power

Cygnus' control panel includes a battery monitoring system which displays the state of charge and voltage of its battery bank. Monitoring the state of charge (SOC) of the battery bank allows the user to ascertain the remaining battery capacity.

3.2.1 Displaying Real-time Battery Bank Voltage

The real-time voltage of the battery bank is displayed by pressing the VOLT button on the Smartgauge (Fig. 1, C1).

3.2.2 Displaying Battery Bank SOC

The SOC is displayed by pressing the Status button on the Smartgauge (Fig. 1, C1) battery monitor. It is indicated by a number preceded with the letter 'C' (e.g. C75). This indicates the percentage of battery life left in the unit. E.g. C75 indicates that there is 75% battery capacity remaining.



The Smartgauge will only indicate the battery level down to C30. This is because the batteries should not be discharged below 30% of their capacity to ensure that they are never allowed to discharge completely, as this will shorten their lifetime considerably. The operating range is from C100 to C30.



Once the Smartgauge reaches C30 Cygnus will automatically switch into Standby Mode and stop delivering AC power until it is sufficiently recharged.

If the 30% lower limit is reached the Smartgauge's internal alarm will be triggered and its display will flash between C29 and error code 'A LS'. The red LED indicator marked 'ALARM' on the Smartgauge will also illuminate.

To restart the unit, the battery bank must be charged back up to above 30%.



The Smartgauge's BATT2 button is not used and should be ignored.

3.3 Emergency Stop Button

1. If there is an emergency and it is necessary to stop the power from the unit, depress the Emergency Stop Button (Fig. 1, C6) on the Control Panel.
2. The unit will then shut down. Cygnus can not be switched on again until the Emergency Stop Button is released by twisting the red part of the button clockwise.
3. Follow the instructions in Section 4 to switch the power back on.

3.4 Turning Off Cygnus

1. To turn the unit off press ESC on the RCC-03 (Fig. 1, C2). 'Turn the System Off?' will be displayed.
2. Press SET to accept. The unit will then go into standby mode.
3. To fully shut down the unit press the On/Off Button (Fig. 1, C4) on the control panel.
4. Turn off the RCD and MCB switches (Fig. 1, B1 & B2).
5. The RCC-03 (Fig. 1, C2) screen will then turn off.
6. Switch off all solar isolator switches (Fig. 1, A1 & A2)



The Smartgauge battery monitor display will always remain on.

3.5 Disconnecting Cygnus

1. Ensure that the steps in Section 4 "Turning Off Cygnus" have been followed.
2. Disconnect the input cable(s).
3. Disconnect the output cable(s)
4. Remove the earth cable by unscrewing the wing nut and replace the washer and wing nut onto the earth bolt.

3.6 Understanding the RCC-03

The RCC-03 gives a real-time indication of the power draw of your consumers, the AC charge facility, DC volts and Amps being discharged and the present state of the system as a whole.

The following diagram indicates the information available from the RCC-03:

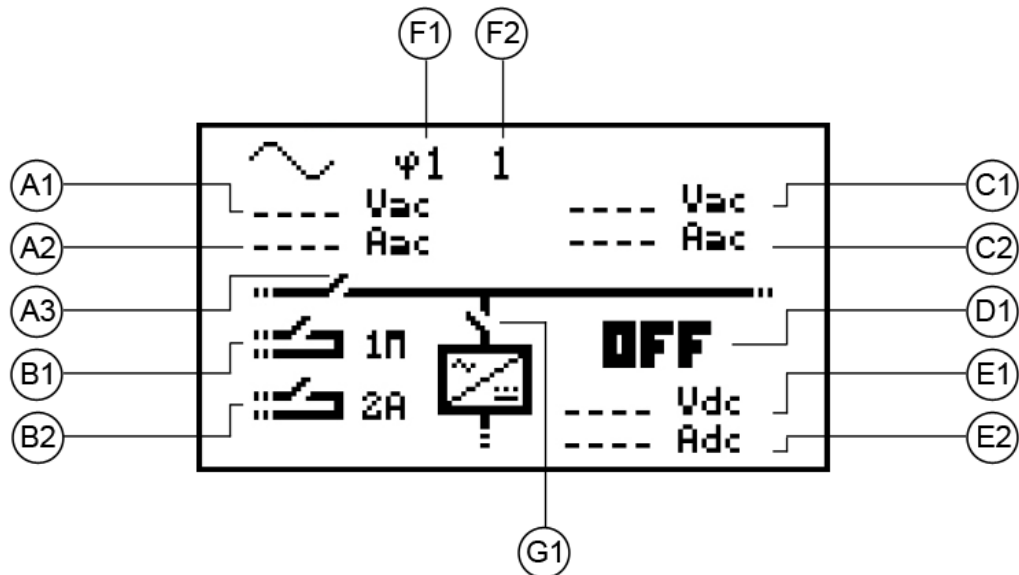


Fig. 4 - The RCC-03

3.6.1 Explanation of the information shown on the RCC-03:

A1	AC Input Volts – indicates the voltage being received by the unit from the AC source. This value is automatically transferred to the AC output. Any excess current not being used by the connected consumers is used to charge the battery bank.
A2	AC Input Amps - Indicates the current in Amps being drawn from the AC source by Cygnus.
A3	AC Input Connection - Indication of whether the AC source is acceptable for Cygnus to use. When the switch symbol is shown closed, the current is flowing to the AC Output and/ or charging the battery bank.
B1	Aux Relay 1 - Not used in the standard models. The relays can activate external alarms and automatic start relays for secondary power systems and can be added as an optional extra. Please contact the manufacturer for further information.
B2	Not used in the standard models. The relays can activate external alarms and automatic start relays for secondary power systems and can be added as an optional extra. Please contact the manufacturer for further information.
C1	AC Output Volts - Indicates voltage being supplied at the AC output.
C2	AC Output Amps - Indicates the current in Amps being drawn from the AC output by the connected consumers.
D1	Standby ON/OFF - Indicates whether Cygnus is in standby mode.
E1	Battery Bank Volts - Indicates the real-time voltage of the battery bank.
E2	Battery Bank Amps - Indicates the current in Amps being drawn from the battery bank.
F1	Phase Indicator - Indicates the phase of the unit. Used when multiple units are connected in series (3 phase).
F2	Cygnus Number - Identifies the unit's number. Used for series (3 phase) or parallel linked systems.
G1	Battery Bank Connection - Indicates the battery bank usage i.e. charging or discharging.

3.7 Charging Methods

Cygnus can be charged using a number of methods including Firefly's portable folding solar arrays (Fold-Array), Firefly's range of Kinectrics equipment and an external AC grid supply or secondary power system. In addition to these charging methods it is also possible to charge Cygnus using wind turbines or alternative solar arrays. Contact the manufacturer for a list of approved products and further details on connection.

3.7.1 Charging with Firefly's Portable Folding Solar Array (Fold-Array)

3.7.1.1 Connecting



Up to five 540 Wp Firefly Portable Solar Folding Arrays can be connected to one unit using suitable parallel junction boxes supplied by the manufacturer. They must not be connected in series.



See Appendix 3 (6.3.2), for an example of connecting more than two arrays to a unit.

1. Once the arrays have been positioned suitably, any junction boxes connected and the extension cables safely run back to Cygnus, the arrays can be connected to the unit.
2. Before connecting the solar extension cables to Cygnus, ensure that the Solar Isolator Switches (Fig. 1, A1 & A2) are turned off.
3. Connect your first array to the Solar Array 1 connectors (Fig. 1, A3) on the control panel. If using a Fold Array parallel junction box to connect multiple arrays, connect its output to the Solar Array 1 connectors.
4. The LED indicator to the right of the connectors will illuminate to show that the connection has been made.
5. If a second array is to be used, connect this to the Solar Array 2 connectors (Fig. 1, A4) on the control panel. If using a second Fold Array parallel junction box to connect multiple arrays, connect its output to the Solar Array 2 connectors.
6. The LED indicator to the right of the connectors will illuminate to show that the connection has been made.
7. Ensure that the connectors are fully engaged to avoid the risk of them pulling out easily and possible electrocution.



It is possible to connect alternate solar arrays up to a combined output of 2.5 kWp and 145V. Contact the manufacturer before connecting arrays from an alternate supplier.

8. Once the Solar Connectors are all safely connected, switch on the solar isolator switches (Fig. 1, A1 & A2) on the left hand side of the control panel.
9. A gradual rise in voltage should be displayed on the Smartgauge battery monitor. It may take up to 2 minutes before any significant change as the power regulation circuits optimise their use of the power from the sun's rays. (This is dependant on the panels receiving sufficient light).

3.7.1.2 Disconnecting

1. To disconnect the solar array from Cygnus, switch off the relevant Solar Isolator switch(es) (Fig. 1, A1/A2) on the control panel.
2. Pull the Solar extension cables out from the control panel connectors (Fig. 1, A3/A4).

3.7.2 Charging with Kinectrics Equipment

3.7.2.1 Connecting

1. The equipment requires the use of a SPEC Pak adapter for connecting to the DC input socket on the unit's control panel (Fig. 1, F1).
2. When connecting one to two Kinectrics units a SPEC Pak to 2 x 50 A Anderson connectors adapter can be used to connect the Kinectrics equipment directly to a Cygnus with suitable extension cables. These are available from the manufacturer. Refer to Appendix 3 (6.3.5) for an example setup.
3. Up to eight Kinectrics units can be connected to a single unit. A junction box is required when connecting between three and four Kinectrics units.
4. Two junction boxes are required when connecting between five and eight Kinectrics units.
5. Once the Kinectrics equipment has been positioned suitably, the extension cables connected and safely run back to Cygnus, the equipment can be connected.
6. Connect the SPEC Pak connector to the unit. Refer to Appendix 2 (6.2.1) for further information on using the SPEC Pak connector.

3.7.2.2 Disconnecting

1. Remove the SPEC Pak connector from the unit. Refer to Appendix 2 (6.2.2) for further information on using the SPEC Pak connector.
2. Disconnect the remaining cables and any junction boxes.

3.7.3 Charging with AC Grid Supply or Secondary Power System

The unit can be charged via a 220 - 240V AC supply from either the AC grid supply or a secondary power system. To connect an AC supply to Cygnus:

1. Connect the 220 - 240V AC supply lead to the AC In socket (Fig. 1, E1) on the control panel.
2. The RCC-03 (Fig. 1, C2) will display a message to confirm that the AC supply has been connected successfully.
3. Press SET to clear the message.
4. The RCC-03 input voltage (Fig. 4, A1) will display the external voltage being applied to the charge facility of the unit.
5. The unit charges its battery bank automatically, regulating the charge cycle and ensuring that the batteries are not over charged.
6. Once the unit is fully charged the Smartgauge (Fig. 1, C1) will display 'C100' indicating that it is 100% full.



WARNING

Cygnus requires a minimum 13 A supply for AC charging. Ensure that your power supply and any inter-connecting cables and fuses have this minimum available current rating.



It is recommended that the unit charges for a further 2 hours once it has reached 100%. This allows the battery bank to fully absorb the charge.

4. Connecting Multiple Cygnus Portable Solar Generators

4.1 Introduction

It is possible to connect multiple Cygnus units together using RJ45 data interlink cables and AC junction boxes. There are two possible configurations:

Cygnus in Parallel

Either two or three units can be connected in parallel. In each case doubling or tripling the peak output and battery bank capacity whilst maintaining a single phase 230V AC output.

Connecting three Cygnus units in parallel will multiply the run-time approximately three times compared with using a single Cygnus with the same load. Connecting multiple units will multiply the current available at the output. For example: connecting 2 CYG500/1380/24 units with a peak capacity of 5.0kVA provides a total system output of 10.0kVA.

Cygnus in Series (3 Phase)

Units can be connected in series to provide a 415V three phase output. This requires that three units are connected together using a junction box (available separately from the manufacturer).



Parallel and series junction boxes are only to be used for their specific role and are not interchangeable.

Check with the manufacturer that the units are preconfigured for parallel or series use before attempting connection.

It is important that the D1, D2 & D3 data connections (Fig.4, D1-3) always have the caps or cable retaining rings secured. Failure to follow this procedure will cause water ingress damage and invalidate the warranty.

Units which do not have the same model number prefix are not suitable for series or parallel connection. For example: It is possible to connect two or three CYG5000/----/-- and it is not possible to connect one CYG5000/----/-- to one CYG3500/----/--.

When connecting in series or parallel, the software version of every unit must be the same. Otherwise the units may not start.

Only use data cables supplied by the manufacturer.

Any interruption of the data connection will cause all units to power off.

4.2 Connecting in Parallel

A parallel junction box (available separately from the manufacturer) is required to connect the AC outputs of each unit.

1. Either two or three units may be used.
2. Turn off the power on all units using the Power On/Off switch (Fig. 1, C4).
3. If using two units, Cygnus 1 should be set as open (Fig. 1, C3: rotate switch anti-clockwise) and Cygnus 2 as Terminated (Fig. 1, C3: rotate switch clockwise).
4. If using three units, Cygnus 1 and Cygnus 2 should be set as Open (Fig. 1, C3: rotate switch anti-clockwise) and Cygnus 3 as Terminated (Fig. 1, C3: rotate switch clockwise).
5. Starting with Cygnus 1, unscrew the protective cover from D2 (Fig. 1, D2) on the control panel and connect the first data interlink cable. Ensure that as the connector is plugged in, the connector's retaining ring is screwed clockwise in to the receptacle on the panel connector. This ensures that water integrity is maintained.

6. If a third Cygnus is being used, connect another data cable between D2 (Fig. 1, D1) of Cygnus 2 and D1 (Fig. 1, D2) of Cygnus 3 by removing the corresponding protective covers and screwing in the retaining rings.
7. Run a 16A CEEform extension cable from the AC output (Fig. 1, E2) of each Cygnus into the corresponding numbered inlet of the parallel junction box.
8. Run a 32A cable from output connector of the junction box to your designated power distribution unit or directly to your consumer(s).
9. Switch on the RCDs and MCBs (Fig. 1, B1 & B2) on all units.
10. Turn on Cygnus 1 using the Power On/Off Switch (Fig. 1, C4). You will hear a long 'beep' and the panel backlight will illuminate. Cygnus 1 should be left in Standby Mode at this point.
11. Turn on the Power On/Off Switch (Fig. 1, C4) on Cygnus 2 and if used, Cygnus 3 so that all 3 are in Standby Mode.
12. On the RCC-03 (Fig. 1, C2) of Cygnus 1. Press Up, then Down to access the Parallel display.
13. Turn on Cygnus 1 using its RCC-03 (Fig. 1, C2). All connected units should turn on simultaneously.
14. Ensure all junction box red indicators are illuminated. This shows that all units are on and operating in parallel mode. Check that all the RCDs and MCBs (Fig. 1, B1 & B2) are still in the 'On' position and none of them have tripped out.

4.3 Connecting in Series

1. Three units must be used.
2. To check whether the units are configured correctly for three phase operation, check the RCC-03 Cygnus number (Fig. 4, F2). The first unit should display L1, the second L2 and the third L3. **Do not attempt to connect the units in series if this is not the case.**
3. Once the unit numbers have been determined, position the three units with L1 on the left, L2 in the centre and L3 on the right.
4. Turn off the power on all units using the Power On/Off switch (Fig. 1, C4).
5. Cygnus 1 and Cygnus 2 should be set as Open (Fig. 1, C3: rotate switch anti-clockwise) and Cygnus 3 as Terminated (Fig. 1, C3: rotate switch clockwise).
6. Starting with unit L1, connect the first data interlink cable to D2 (Fig. 1, D2) on the control panel. Ensure that as the connectors are plugged in, the connector's retaining ring is screwed clockwise in to the receptacle on the panel connector. This ensures that water integrity is maintained.
7. Connect the other end of this cable to D1 (Fig. 1, D1) on the control panel of unit L2.
8. Plug a second Data cable into D2 (Fig. 1, D2) on the control panel of the unit L2.
9. Connect the other end of this cable to D1 (Fig. 1, D1) on the control panel of unit L3.
10. Run a 16A cable from the AC output (Fig. 1, E2) of each Cygnus into the corresponding numbered input of the series junction box.
11. Run a 32A 3 phase (3P+N+E) CEEform cable from the output connector of the junction box to your designated power distribution unit or consumer(s).
12. Check that all the data cable connections are plugged in correctly.
13. Switch on the RCDs and MCBs (Fig. 1, B1 & B2) on all units.
14. Double check that all connections are secure, then turn on unit 1 using the Power On/Off Switch (Fig. 1, C4). A long 'beep' will be audible and the RCC-03 backlight will illuminate. Unit 1 should be left in standby mode at this point.
15. Turn on the Power On/Off Switch (Fig. 1, C4) on Cygnus 2 and then Cygnus 3 so that all three are in standby mode.

16. Using the RCC-03 control screen (Fig. 1, C2) of Cygnus 1. Press Up, then Down to access the serial display.
17. Turn on unit 1 using its RCC-03 (Fig. 1, C2). To do this, press the Esc button: "Turn on the system?" is displayed. Press the Set button to select. All connected units should turn on simultaneously.
18. Ensure that all red indicators on the series junction box are illuminated. This shows that all units are on and the 3 phase output is operational. Check that all the RCDs and MCBs (Fig. 1, B1 & B2) are still in the 'On' position and none of them have tripped out.

4.4 Turning Off The Units

1. Using the RCC-03 (Fig. 1, C2) of Cygnus 1. Press Up, then Down to wake up the control panel.
2. Press the Esc button to choose to power off the screen "Turn off the system?" will be displayed, press the Set



If problems persist, consider replacing the data cable(s) as they are delicate and successful series operation of the units relies on the data connection to keep the units in phase.

button to confirm.

4.5 Disconnecting Data Interlink Cables:

1. Ensure that all units are turned off before any data disconnections are made.
2. Unscrew the data interlink cable(s) retaining rings anti-clockwise and replace the weatherproofing caps onto the unit by screwing them back on clockwise.

5. Care and Maintenance

5.1 General cleaning

Minor cleaning should be performed using a damp microfiber cloth. Detergents or chemicals should not be used.

5.2 Washing Cygnus with a High Pressure Cleaner or Hosepipe

When cleaning Cygnus with a high pressure cleaner or hosepipe, always follow the operating instructions for the equipment. Ensure that the stream of water is always directed downwards at an angle of no more than 60°. This is to prevent unwanted water ingress to the unit via the airflow vents which could cause electrical failure. If you believe that water has entered the unit, under no circumstances should the unit be powered on. Contact the manufacturer before use.

The control panel should only be cleaned with a damp microfiber cloth.

Ensure that the system is switched off before cleaning.



WARNING

Under no circumstances should the control panel be cleaned using a pressure washer or hosepipe. Detergents must not be used.



WARNING

Under no circumstances should the unit be used to power any cleaning equipment being used to clean the unit.

5.3 - Paintwork Repair

Minor damage to the paint such as scratches or stone chips should be touched up without delay before the metal starts to corrode. Suitable touch up brushes or sprays for Cygnus can be obtained from the manufacturer.

5.4 - Testing

It is recommended that the unit should be tested annually for safety by a qualified electrician.

Local regulations may require more frequent testing. Please refer to local regulations for further details.

If Cygnus does not pass the relevant tests, do not use or open the unit. It must only be opened by a qualified service engineer.

It is recommended that a full service is performed every two years in order to ascertain the condition of your system. Please contact the manufacturer for further information.



WARNING

Opening the unit may cause electrocution



Opening the unit will invalidate the warranty

5.5 Caring for the Battery Bank

Cygnus uses sealed, maintenance free batteries. The only routine care necessary is to ensure that when not in use, the unit is charged at least once a month to keep the battery bank topped up.



Leaving the batteries in a state of discharge for extended periods will seriously affect their performance.

6.1 Appendix 1 - Additional RCC-03 Settings

The RCC-03 provides control over a number of Cygnus' settings. Two useful settings including boosting the voltage over distance and the language used in the display.

6.1.1 Boosting the Voltage Over Distance

If the cable run between the unit and the AC consumers is more than 50m, a drop in voltage can occur. Failure to boost the voltage can result in the consumers not receiving the required voltage.

To boost the voltage:

1. Use the RCC-03 arrow keys (Fig. 1, C2) to navigate down to 'Basic Settings'.
2. Press SET to enter this sub-menu.
3. Use the arrow keys to navigate down to 'AC Voltage'. Press SET to adjust the setting.
4. Use the arrow keys to input the required voltage. A maximum of 245V is available. Press SET to accept.
5. Press ESC to navigate back to the main menu and the arrow keys to return to the main screen.



When using the unit with cable runs of less than 50m after boosting the voltage, be sure to return the unit to its default voltage setting. Repeat the above steps and return the voltage to 230V in step 4.

6.1.2 Setting the RCC-03 Language

1. Press the down RCC-03 arrow key (Fig. 1, C2) to navigate to 'Remote Controller Settings'.
2. Press the SET key to enter the Remote Control Settings.
3. The language choices menu is displayed.
4. Press the SET key to modify the current language.
5. Use the upwards and downwards arrow keys to select the required language.
6. Confirm the selection by means of the SET key (OK).
7. Press ESC to leave the settings for the remote control.

6.2 Appendix 2 - 24V DC SPEC Pak Input/Output

The Spec Pak socket (Fig. 1, F1) is a 24V 2 x 40A input and output connector.

The socket can be used to connect Kinectrics equipment (refer to Appendix 3, (6.3.5)) or a wind turbine for charging the unit. Only Firefly Solar approved equipment should be plugged into this connector. Contact the manufacturer for a list of approved wind turbines.

This can be used as an unregulated 24V output. Contact the manufacturer for more information about suitable adapters and appliances.

6.2.1 Connecting the SPEC Pak Plug

1. The SPEC Pak socket is fitted with a waterproof cover (Fig. 5, Step 1).
2. Remove the cover by hinging up the retaining clip and pulling out (Fig. 5, Step 2).
3. Insert the connector, hinge down the retaining clip to secure (Fig. 5, Step 3).

6.2.2 Disconnecting the SPEC Pak Plug

1. Disconnect the plug by hinging up the retaining clip and pulling out the plug (Fig. 5, Step 2).
2. Replace the weatherproofing cover
3. Hinge down the retaining clip to secure (Fig. 5, Step 1).



Fig. 5 - 24V 80 A DC SPEC Pak Connector



The weatherproofing cover must always be replaced when the SPEC Pak socket is not in use. Failure to do so may cause water ingress damage to the unit and invalidate the warranty.

6.3 Appendix 3 - Example Configurations

6.3.1 On or Off-Grid UPS

Grid or secondary power system supplied AC power is connected to the AC Input plug. The consumers are connected to the AC output socket.

The batteries are kept at full capacity and are only used if there is a break in input voltage.



It is possible for Cygnus to auto-start a secondary power system when the battery bank capacity approaches its lower limit. Contact the manufacturer for further information on this optional extra.

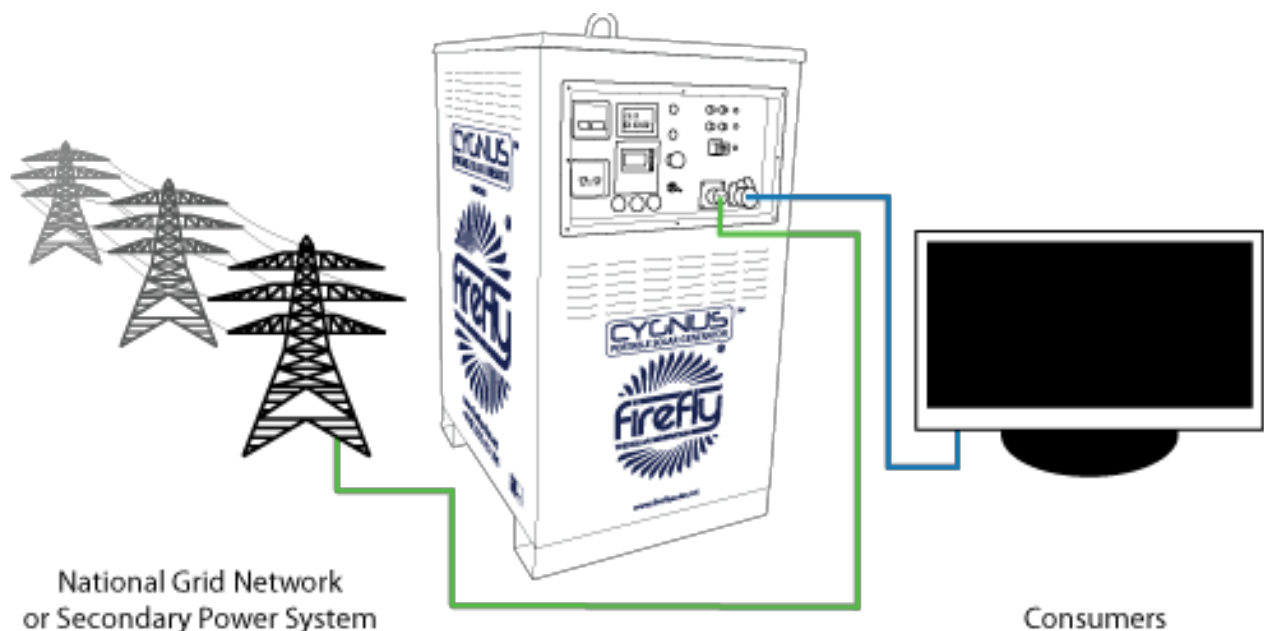


Fig. 6 - Example Showing A Single Unit Connected To An AC Feed and Powering Consumers

6.3.2 Single Cygnus Portable Solar Generator

One or more solar arrays are connected to the Solar Input(s). The consumers are connected to the AC output socket. The solar arrays power the consumers and any surplus power keeps the batteries topped up. Battery power is used when the consumers require more power than the solar arrays are generating.

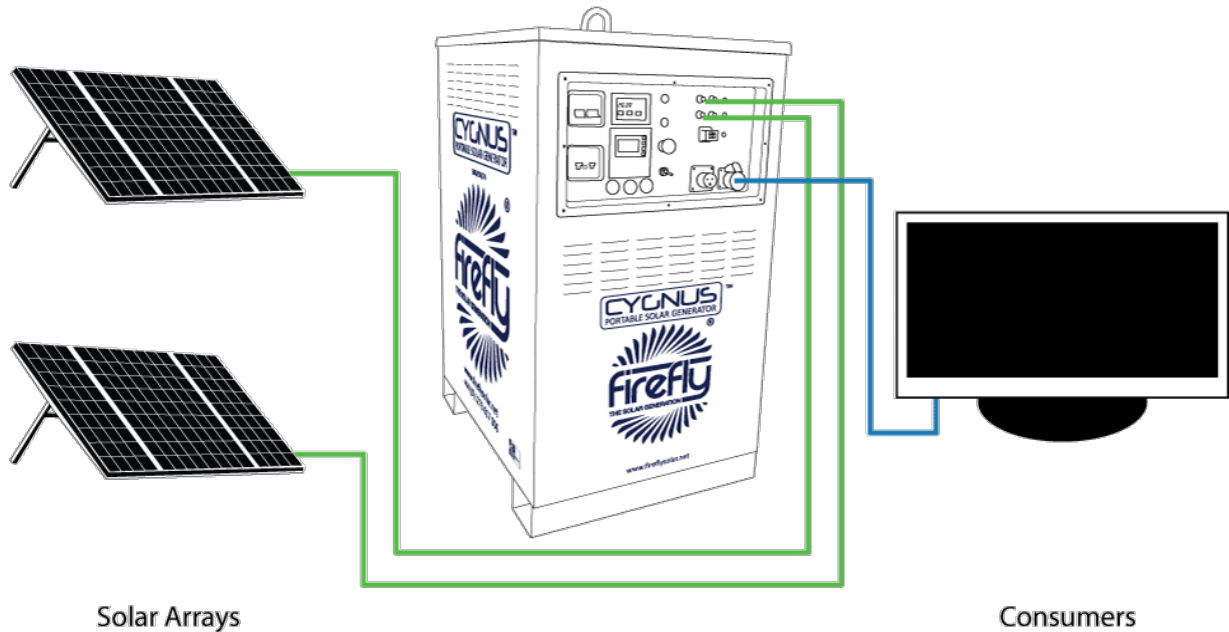


Fig. 7 Example Showing Arrays Directly Connected to the Unit's Solar Inputs

When using more than two panels it is necessary to use an optional junction box, available from the manufacturer.

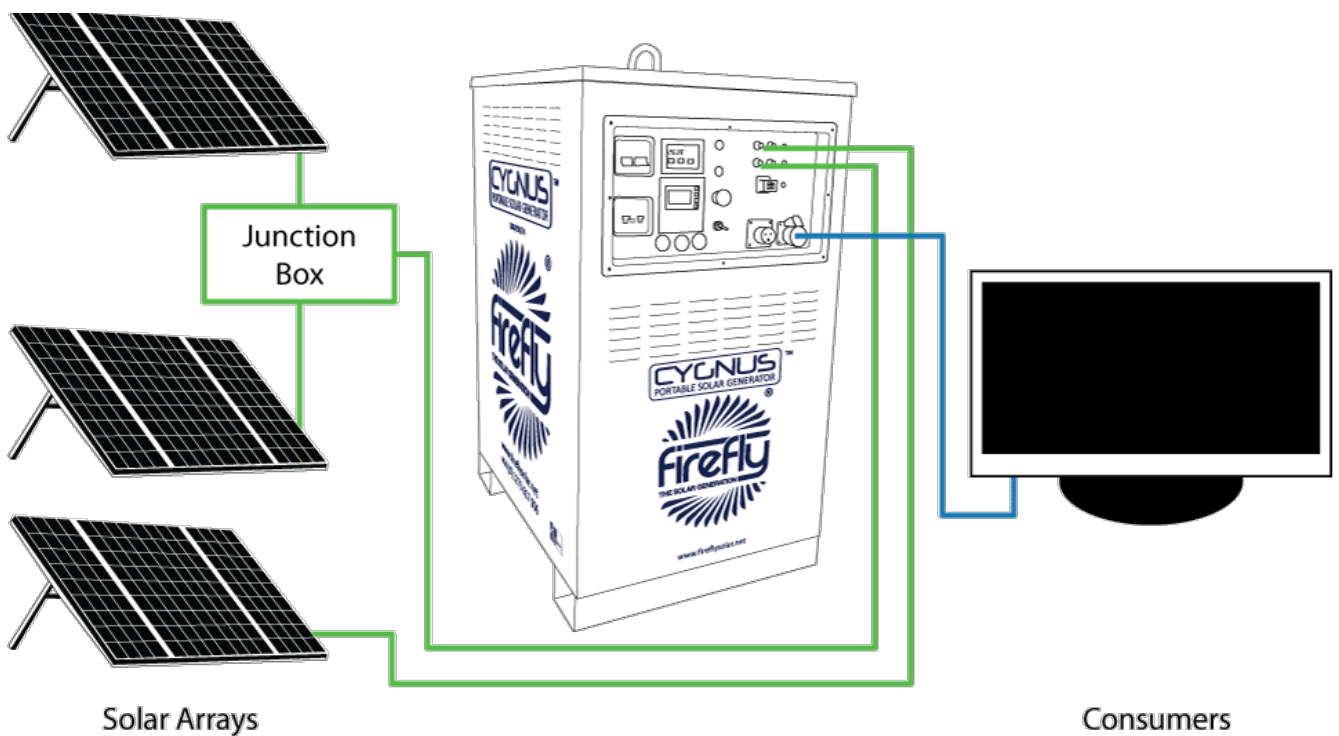


Fig. 8 - Example Showing the Use of a Junction Box to Allow the use of More Than Two Arrays

6.3.3 Three Phase Cygnus System

Three pre-configured units are connected by means of data cables and a series junction box (available separately from the manufacturer).

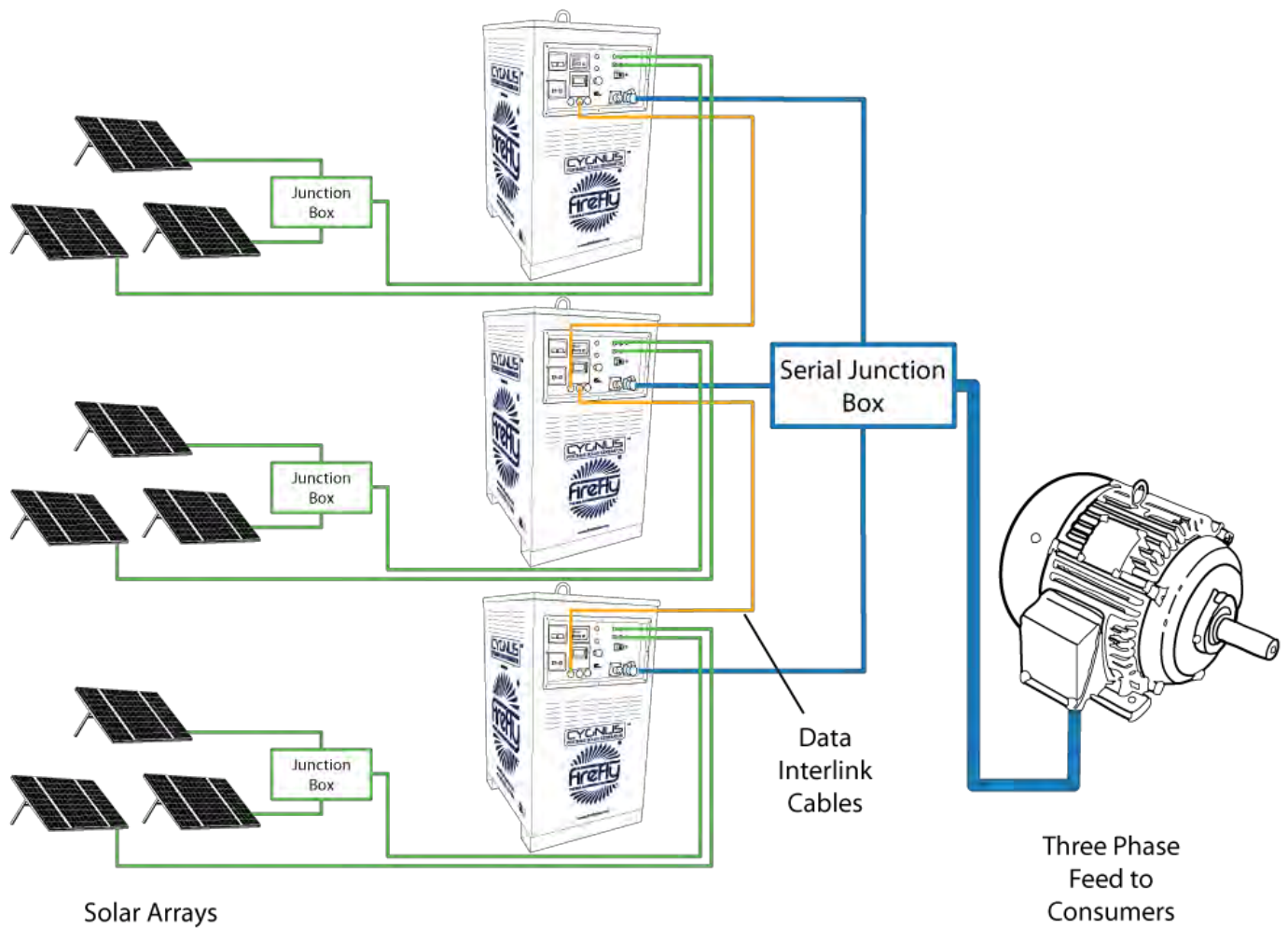


Fig. 9 - Example Showing the Use of Three Units to Provide a Three Phase Output

6.3.4 Two Unit Parallel Cygnus System

Two units are connected by means of a data interlink cable and a parallel junction box (available separately).

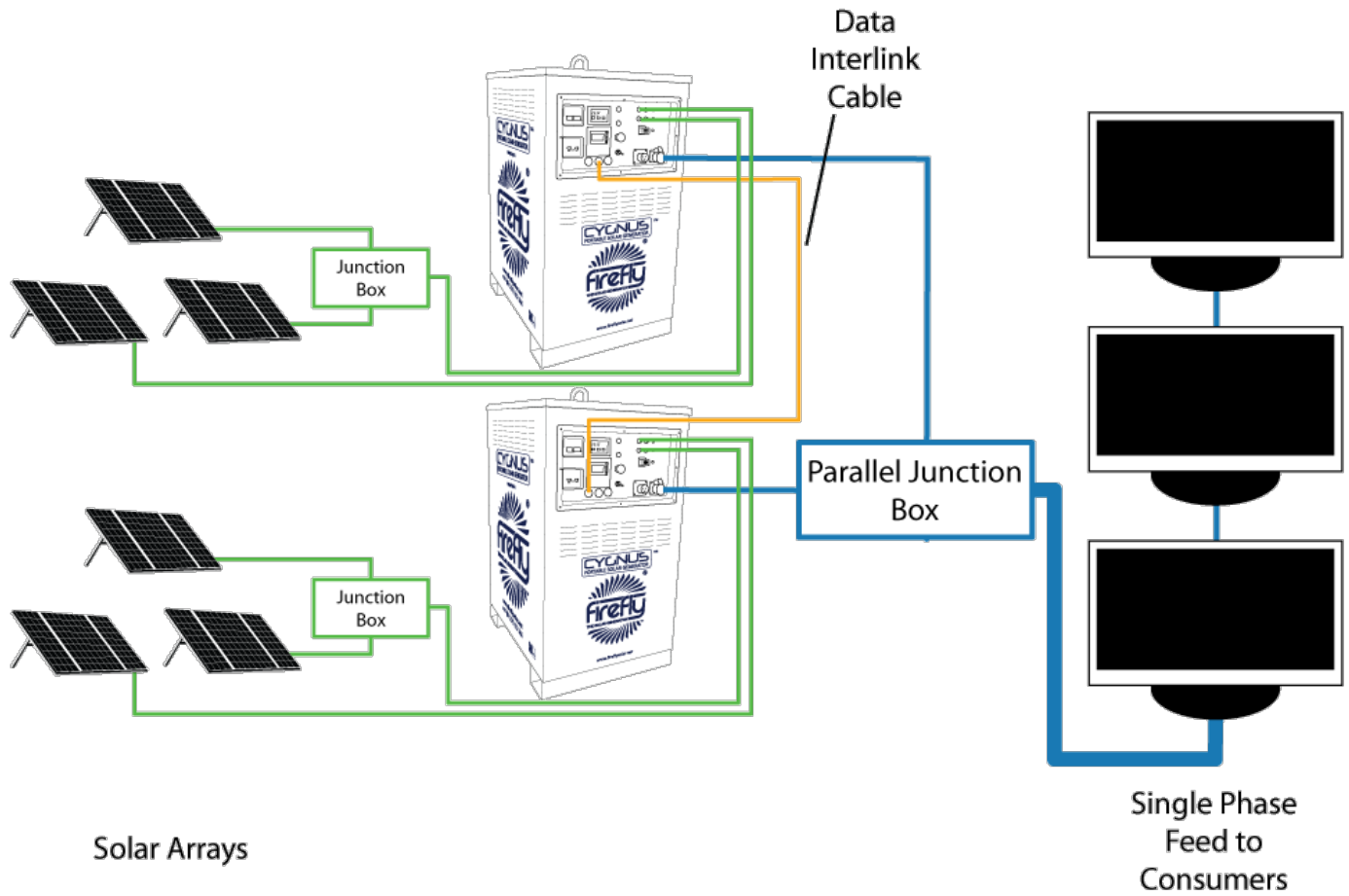


Fig. 10 - Example Showing the use of Two Units to Provide a Higher Output

6.3.5 Kinectrics PedGen Connected to Single Cygnus

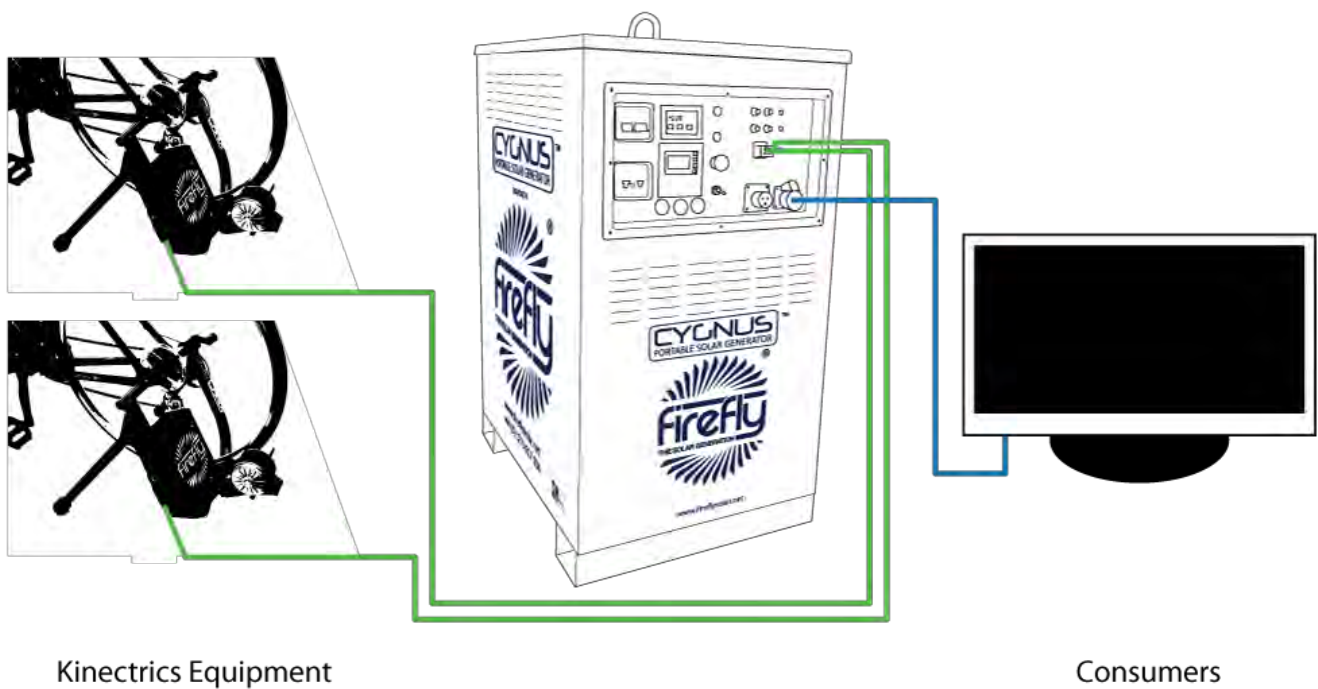


Fig. 11 - Example Showing the use of Two Kinectrics Units to Charge Cygnus

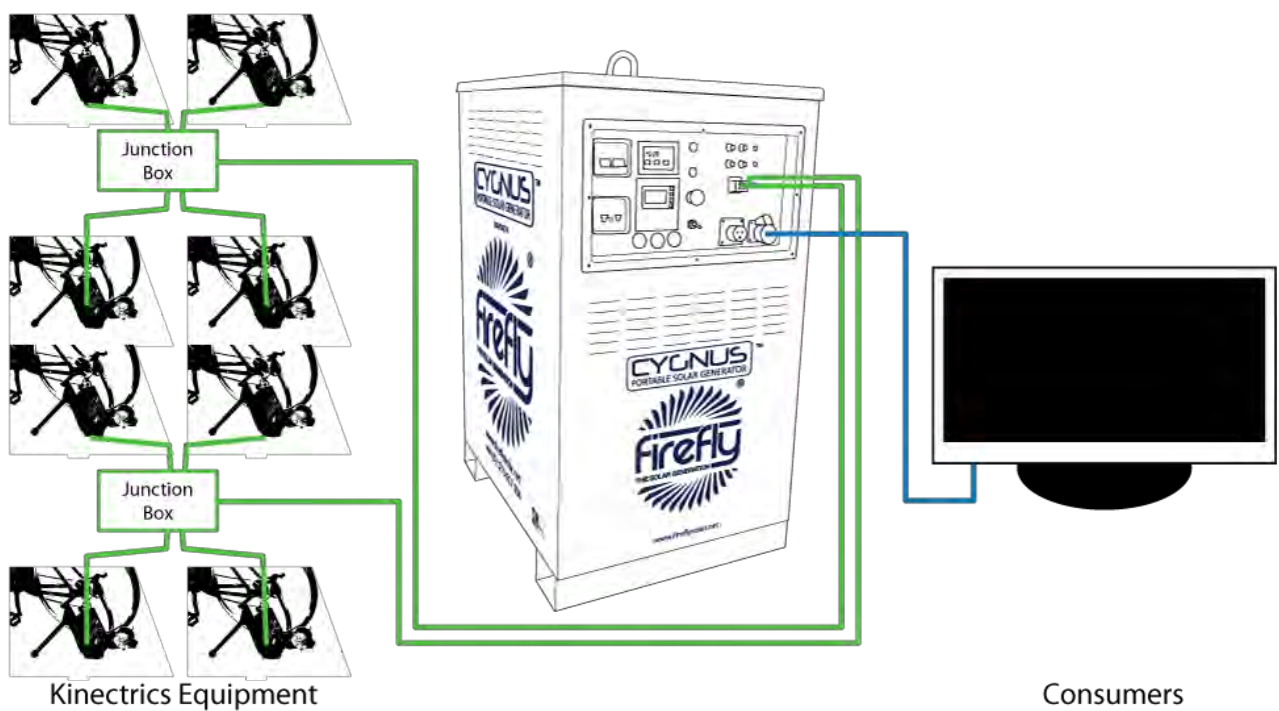


Fig. 12 - Example Showing the use of Eight Kinectrics Units to Charge Cygnus

6.4 Appendix 4 - Troubleshooting Guide

Issue	Possible Cause(s)	Suggestions
Power is on at the Cygnus but the consumers are not receiving any power	The MCBs or RCDs may not be switched on	Check the MCBs and RCDs (Fig.1, B1 & B2) are pushed up to the on position.
The system has been switched on with the Power On/ Off button but there is no display on the RCC-03	The emergency stop button may be depressed	Twist the emergency switch clockwise to release.
Voltage is lower than 220V over distance	Voltage drop over long cable distances	If the distance between the unit and the consumers is more than 50m the voltage can drop too low. The voltage can be boosted by following the instructions in Appendix 1, (6.1.1)
The indicators on an external junction box are flashing	Cygnus is in Load Search mode	This is normal and is a power saving function. When consumers are connected the unit(s) will automatically switch out of this mode and the indicators should stay on as long as power is being used.
Message on RCC-03: "Battery Voltage Too Low"	This indicates that the voltage has reached its lower limit in the battery bank	Charge Cygnus from your chosen renewable power source or from an AC grid or secondary power systems.
The RCD keeps tripping	There is an electrical fault with the consumers connected to the AC output	Check the electrical integrity of the consumers being connected to the unit.
The MCB keeps tripping	The consumers being connected draw too much power for the rated output of the unit	Refer to the maximum output rating on the unit's rating plate and reduce the total power draw accordingly.
All units in series or parallel connection do not enable	Data connection was unsuccessful	Turn off the units using the Cygnus 1 RCC-03 (Fig. 1, C2), check the integrity of all connections and that they have been made correctly. Attempt to restart the units.



WARNING

If the unit shuts down due to low voltage or overload it will restart automatically when the issue has been resolved.

6.5 Appendix 5 - Technical Data

The following table provides information on the entire Cygnus Solar Generator range. To find the relevant information for your unit, please refer to the model number on its rating plate at the bottom of the left hand panel, or the main graphics on each side of the unit.

The model number is configured as follows: CYG\inverter peak output/battery bank capacity/battery bank voltage

Model Number	CYG2400/450/24	CYG2400/920/24	CYG2400/1380/24	CYG3500/920/24	CYG3500/1380/24	CYG5000/920/24	CYG5000/1380/24
Continuous Output @ 25°C		2.0kVA		3.0kVA		4.5kVA	
Peak Power Output @ 25°C (30 minutes)		2.4kVA		3.5kVA		5.0kVA	
Peak Power Output @ 25°C (5 seconds)		6.0kVA		9.0kVA		12.0kVA	
Output Voltage (Pure Sine, Adjustable)*	190-245V						
Output Frequency - (Adjustable)**	45-65Hz						
Inverter Protection	Overload, Overheat, Short Circuit						
Circuit Protection - B-type MCB (Amps)	10			16			20
Earth Fault Protection	25A 30mA RCD						
Power Output Connections	1x16A 240V SP CEEform						
Solar Power Input***	Maximum Solar Array of 2.5kWp						
Wind Power Input****	Maximum of 2kWp						
Charge Time (Hrs) (using 16A inlet)*****	2.5	5.5	8	5	8.5	5.5	8.5
Run Time (no solar charge) @ 1.0kVA (hrs)	4.5	11	17	10	18	10.5	18
Run Time (no solar charge) @ 2.0kVA (hrs)	1.5	4	7	4	7.5	4.5	7.5
Run Time (no solar charge) @ 3.0kVA (hrs)				2	4	2.5	4.5
Run Time (no solar charge) @ 4.0kVA (hrs)						1.5	3
Weight (kg)	480	700	920	700	920	700	920
Dimensions - (Width x Height x Depth)	712mm x 1319mm x 951mm						
Set Up Time (minutes)	10						

Fig. 13 - Technical Data

6.6 Appendix 6 - Further Reading

This document contains all information required for day to day running of Cygnus. If you would like further information about the internal components, please see the following manuals on the manufacturers' websites.



WARNING

Do not change any settings which are not outlined in this Cygnus Portable Solar Generator user manual. Failure to comply with this notice will invalidate the unit's warranty.

Xtender Inverter

English

<http://www.studer-innotec.com/upload/temp/Xtender%20series%20User%20manual.pdf>

French

<http://www.studer-innotec.com/upload/temp/Manuel%20utilisateur%20s%C3%A9rie%20Xtender.pdf>

German

<http://www.studer-innotec.com/upload/temp/Benutzerhandbuch%20Xtender%20Serie.pdf>

Spanish

<http://www.studer-innotec.com/upload/temp/Manual%20usuario%20gama%20Xtender.pdf>

Italian

[http://www.studer-innotec.com/upload/temp/Manuale%20d'uso%20Xtender%20serie%20\(It\).pdf](http://www.studer-innotec.com/upload/temp/Manuale%20d'uso%20Xtender%20serie%20(It).pdf)

RCC-03

English

<http://www.studer-innotec.com/upload/temp/RCC-02-03%20User%20manual.pdf>

French

<http://www.studer-innotec.com/upload/temp/Manuel%20utilisateur%20RCC-02-03.pdf>

German

<http://www.studer-innotec.com/upload/temp/Benutzerhandbuch%20RCC-02-03.pdf>

Spanish

<http://www.studer-innotec.com/upload/temp/Manual%20usuario%20RCC-02-03.pdf>

Italian

[http://www.studer-innotec.com/upload/temp/Manuale%20d'uso%20RCC-02-03%20\(It\).pdf](http://www.studer-innotec.com/upload/temp/Manuale%20d'uso%20RCC-02-03%20(It).pdf)

Flexmax 80 Charge Controller

English

http://www.outbackpower.com/pdf/manuals/flexmax_80.pdf

Russian

http://www.outbackpower.com/pdf/manuals/flexmax_russian.pdf

French

http://www.outbackpower.com/pdf/manuals/flexmax_french.pdf

Spanish

http://www.outbackpower.com/pdf/manuals/flexmax_spanish.pdf